

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-20 and 22 are pending in the present application. Claims 1-5, 7-17, 19, 20, and 22 are amended by the present amendment.

In the outstanding Office Action, Claim 20 was rejected under 35 U.S.C. § 112, first and second paragraphs, Claims 1, 8, 9, 13, 19, and 22 were rejected under 35 U.S.C. § 102(e) as anticipated by Robinson et al. (U.S. Patent No. 6,315,723, herein “Robinson”); Claims 1, 8, 9, 13, 19, and 22 were rejected under 35 U.S.C. § 102(e) as anticipated by Hossack et al. (U.S. Patent No. 5,957,852, herein “Hossack”); Claims 1, 2, 8, 9, 13, 14, 19, and 22 were rejected under 35 U.S.C. § 102(b) as anticipated by Seyed-Bolorforosh et al. (U.S. Patent No. 5,891,038, herein “Seyed-Bolorforosh”); Claims 1, 3-6, 8-10, 12, 13, 15-20, and 22 were rejected under 35 U.S.C. § 102(e) as anticipated by Chiao et al. (U.S. Patent No. 5,980,459, herein “Chiao”); Claims 3, 4, 12, 15, and 16 were rejected under 35 U.S.C. § 103(a) as unpatentable over Seyed-Bolorforosh; Claims 3-7, 10-12, and 14-18 were rejected under 35 U.S.C. § 103(a) as unpatentable over Seyed-Bolorforosh and Ustuner et al. (U.S. Patent No. 6,432,054, herein “Ustuner”); and Claim 20 was rejected under 35 U.S.C. § 102(e)/103(a) as unpatentable over any of Averkiou et al. (U.S. Patent No. 6,186,950, herein “Averkiou '950”), Haider et al. (U.S. Patent No. 6,063,033, herein “Heider”); Ermert et al. (U.S. Patent No. 6,155,981, herein “Ermert”); Gee et al. (U.S. Patent No. 6,358,210, herein “Gee”); Averkiou (U.S. Patent No. 6,319,203, herein “Averkiou '203”); Hwang et al. (U.S. Patent Nos. 6,228,031 and 6,193,662, hereinafter “Hwang '031 and Hwang '662, respectively”), in addition to Chiao.

Regarding the rejections of Claim 20 under 35 U.S.C. § 112, first and second paragraphs, Claim 20 has been amended as suggested in the outstanding Office Action and to correct minor informalities. Further, Applicants respectfully submit that the specification at page 32, line 13, to page 33, line 20, specifically discloses that “scanning is performed so as to carry out transmission for each scanning line in [a] number … larger than the number … of the pulse invention technique.” Applicants respectfully submit that the pulse inversion technique, which is well-known in the art, is modified by the present invention to increase a number of transmissions for each scanning line. Thus, a bandwidth broadening effect is achieved as further disclosed in the specification at page 23, first full paragraph.

Accordingly, it is respectfully requested these rejections be withdrawn.

Claims 1, 8, 9, 13, 19, and 22 were rejected under 35 U.S.C. § 102(e) as anticipated by Robinson. That rejection is respectfully traversed.

Independent Claims 1, 13, and 22 have been amended to recite transmission characteristics of ultrasonic pulses transmitted along each scanning line during each time of scanning of a region are “changed from one another.” Further, independent Claims 1, 13, and 22 have been amended to recite that characteristics of a filtering process applied to each of reception signals are changed from one another and are respectively related in frequency domains to the transmission characteristics of the ultrasonic pulses. The claim amendments find support at page 14, second and third full paragraphs, and in Figures 3A, 3B, 4A, and 4B. No new matter is believed to be added.

Briefly recapitulating, independent Claim 1 is directed to an ultrasonic diagnostic apparatus for scanning a subject with an ultrasonic pulse. The apparatus includes transmitting means for transmitting the ultrasonic pulse a plurality of times along each scanning line so as to scan during each time of scanning a region in the subject.

Transmission characteristics of ultrasonic pulses transmitted along each scanning line during each time of scanning of the region are changed from one another. The apparatus further includes receiving means for receiving an ultrasonic echo signal of each ultrasonic pulse, and filter means for applying filtering processing to each reception signal acquired by the receiving means. Characteristics of the filtering processing applied to each of the reception signals acquired along each scanning line during each time of scanning of the region are changed from one another and are respectively related in frequency domains to the transmission characteristics of the ultrasonic pulses transmitted along each scanning line during each time of scanning of the region. Independent Claims 13 and 22 have been amended to recite similar features as independent Claim 1.

Turning to the applied art, Robinson discloses an ultrasonic imaging system provided with an extended focus scanline. However, Robinson does not teach or suggest (i) transmission characteristics of ultrasound pulses transmitted along each scanning line during each time of scanning of a region being mutually changed, and (ii) characteristics of a filtering processing applied to each of the reception signals acquired along each scanning line during each time of scanning of the region being changed from one another. Accordingly, it is respectfully submitted that independent Claims 1, 13, and 22 and each of the claims depending therefrom patentably distinguish over Robinson.

Claims 1, 8, 9, 13, 19, and 22 were rejected under 35 U.S.C. § 102(e) as anticipated by Hossack. That rejection is respectfully traversed.

Hossack discloses at column 9, last paragraph, that a controller 170 shown in Figure 10 controls a plurality of beamformers. However, Hossack does not teach or suggest (i) transmission characteristics of ultrasonic pulses transmitted along each scanning line during each time of scanning of a region being changed from one another, and (ii) characteristics of

a filtering processing applied to each of the reception signals acquired along each scanning line during each time of scanning of the region being changed from one another.

Accordingly, it is respectfully submitted that independent Claims 1, 13, and 22 and each of the claims depending therefrom patentably distinguish over Hossack.

Claims 1, 2, 8, 9, 13, 14, 19, and 22 were rejected under 35 U.S.C. § 102(b) as anticipated by Seyed-Bolorforosh. That rejection is respectfully traversed.

Seyed-Bolorforosh discloses a method for firing two or more pulses similar to Hossack. However, Seyed-Bolorforosh does not teach or suggest the claimed features discussed above.

Accordingly, it is respectfully submitted that independent Claims 1, 13, and 22 and each of the claims depending therefrom patentably distinguish over Seyed-Bolorforosh.

Claims 1, 3-6, 8-10, 12, 13, 15-20, and 22 were rejected under 35 U.S.C. § 102(e) as anticipated by Chiao. That rejection is respectfully traversed.

Chiao discloses a method for selectively performing contrast harmonic imaging with a system that utilizes phase-coded excitation on transmit and selective firing-to-firing filtering on receive.¹ However Chiao does not teach or suggest the features of independent Claims 1, 13, and 22 discussed above.

Accordingly, it is respectfully submitted that independent Claims 1, 13, and 22 and each of the claims depending therefrom patentably distinguish over Chiao.

Independent Claim 12 is directed to an ultrasonic diagnostic apparatus having a transmitting unit that transmits an ultrasonic pulse a plurality of times along each scanning line so as to scan each time of scanning a region in a subject. The ultrasonic pulse has a first bandwidth with a spectrum characteristic set to such an extent that a signal component corresponding to a harmonic component of the ultrasonic pulse is separable from a signal

¹ Chiao, see Abstract.

component corresponding to a fundamental component of the ultrasound pulse. In addition, the scanning apparatus has a receiving/processing unit that receives an echo signal of the ultrasonic pulse and processes the echo signal into a harmonic signal having a second bandwidth with a spectrum characteristic broader than the first bandwidth of the transmitted ultrasonic pulse.

Independent Claim 20 has been amended to recite that a transmitting unit transmits an ultrasonic pulse a plurality of times along each scanning line so as to scan each time of scanning a region in a subject and transmission characteristics of the ultrasound pulses are changed one from the other.

However, Chiao does not teach or suggest either a first bandwidth with a spectrum characteristic and a second bandwidth with a spectrum characteristic broader than the first bandwidth, or transmission characteristics of the ultrasound pulses being changed one from the other, as required in Claims 12 and 20, respectively.

Accordingly, it is respectfully submitted that independent Claims 12 and 20 patentably distinguish over Chiao.

Claims 3, 4, 12, 15, and 16 were rejected under 35 U.S.C. § 103(a) as unpatentable over Seyed-Bolorforosh. That rejection is respectfully traversed.

Seyed-Bolorforosh does not teach or suggest transmitting an ultrasonic pulse a plurality of times along each scanning line so as to scan each time of scanning a region, and a transmitted ultrasonic pulse having a first bandwidth with a spectrum characteristic and an echo signal having a second bandwidth with a spectrum characteristic broader than the first bandwidth, as required by independent Claim 12.

Accordingly, it is respectfully submitted that independent Claim 12 patentably distinguishes over Seyed-Bolorforosh. In addition, it is respectfully submitted that Claims 3,

4, 15, and 16 are also allowable because these claims depend from independent Claims 13 and 22, which are believed to be allowable as noted above.

Claims 3-7, 10-12, and 14-18 were rejected under 35 U.S.C. § 103(a) as unpatentable over Seyed-Bolorforosh. That rejection is respectfully traversed.

As discussed above, it is believed that independent Claim 12 patentably distinguishes over Seyed-Bolorforosh. In addition, Claims 3-7, 10, 11, and 14-18 depend from Claims 13 and 22, which are believed to be allowable as noted above. Accordingly, it is respectfully submitted that depend Claims 3-7, 10, 11, and 14-18 are also allowable.

Claim 20 was rejected under 35 U.S.C. § 102(e)/103(a) as unpatentable over any of Averkiou '950, Haider, Ermert, Gee, Averkiou '203, Hwang '031, and Hwang '662 in addition to Chiao. That rejection is respectfully traversed.

None of the applied art teaches or suggests a transmitting unit that transmits an ultrasonic pulse a plurality of times along each scanning line so as to scan each time of scanning a region in a subject, and transmission characteristics of ultrasound pulses being changed one from the other, as required by independent Claim 20 discussed above.

Accordingly, it is respectfully submitted that independent Claim 20 patentably distinguishes over Averkiou '950, Haider, Ermert, Gee, Averkiou '203, Hwang '031, Hwang '662, and Chiao, either alone or in combination.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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